CLAIMS

1. A method of producing polymer foam, comprising:

heating a polymer resin to a melt temperature therefor;

selecting at least one blowing agent consisting of at least one ambient gas;

combining the heated polymer resin with the at least one blowing agent to create a mixture; and

extruding polymer foam from the mixture comparable in quality to that obtainable with hydrocarbon blowing agents.

2. The method of claim 1, wherein the extruding comprises guiding the mixture through an exiting channel to an exit with a cross-sectional area larger than at least one point within the exiting channel.

3. The method of claim 2, wherein the cross-sectional area of the exit is at least about twice as large as that of the at least one point.

4. The method of claim 2, wherein the extruding further comprises reducing friction within at least a portion of the exiting channel.

5. The method of claim 4, wherein the exiting channel comprises a first portion from an entrance to a point having a smallest cross-sectional area and a second portion from the point having the smallest cross-sectional area to the exit, and wherein the reducing comprises controlling a temperature of the second portion.

6. The method of claim 5, wherein the controlling comprises keeping the second portion at a temperature of between about 15° Celsius and about 95° Celsius.

7. The method of claim 6, wherein the keeping comprises keeping the second portion at a temperature of between about 25° Celsius and about 60° Celsius.

8. The method of claim 5, further comprising at least partially thermally isolating the first portion from the second portion.

9. The method of claim 8, wherein the at least partially thermally isolating comprises locating at least one air gap between the first portion and the second portion.

10. The method of claim 4, wherein the reducing comprises coating the at least a portion of the exiting channel with a friction-reducing substance.

11. The method of claim 10, wherein the coating comprises coating the at least a portion of the exiting channel with titanium nitride.

12. The method of claim 10, wherein the coating comprises coating the at least a portion of the exiting channel with tungsten carbon carbide.

13. The method of claim 10, wherein the coating comprises coating the at least a portion of the exiting channel with a composite comprising nickel and one of tetrafluoroethylene fluorocarbon polymer and fluorinated ethylene-propylene.

14. The method of claim 1, wherein selecting the at least one blowing agent comprises selecting from among carbon dioxide, nitrogen and argon.

15. The method of claim 1, wherein the extruding comprises extruding polymer foam from the mixture having a specific gravity of between about 0.05 g/cc and about 0.15 g/cc and an average cell diameter of about 0.05 mm to about 1 mm.

16. The method of claim 15, wherein the extruding comprises extruding polymer foam sheet from the mixture having a thickness of between about 0.75 mm and about 6 mm.

17. The method of claim 16, wherein the extruding comprises extruding polymer foam sheet from the mixture having less than about 5% gauge variation across a width thereof.

18. An annular die for producing polymer foam, comprising an exiting channel having an exit with a cross-sectional area larger than at least one point within the exiting channel.

19. The annular die of claim 18, wherein the cross-sectional area of the exit is at least about twice as large as that of the at least one point.

20. The annular die of claim 18, wherein an exit angle of foam sheet produced with the annular die is between 0° and about 90°.

21. The annular die of claim 18, wherein the exiting channel comprises a first portion from an entrance to a point having a smallest cross-sectional area and a second portion from the point having a smallest cross-sectional area to the exit.

22. The annular die of claim 21, further comprising a thermal break between the first portion and the second portion.

23. The annular die of claim 22, wherein the thermal break comprises at least one air gap.

24. The annular die of claim 21, wherein the first portion and the second portion are integrated.

25. The annular die of claim 21, wherein the second portion is coupled to the first portion.

26. The annular die of claim 18, further comprising a friction-reducing coating on at least a portion of an inner surface of the exiting channel.

27. The annular die of claim 26, wherein the friction-reducing coating comprises titanium nitride.

28. The annular die of claim 26, wherein the friction-reducing coating comprises tungsten carbon carbide.

29. The annular die of claim 26, wherein the friction-reducing coating comprises a composite comprising nickel and one of tetrafluoroethylene fluorocarbon polymer and fluorinated ethylene-propylene.

30. The annular die of claim 18, wherein a transition angle is between about 15° and about 180°.

31. A system for producing polymer foam, comprising:

an annular die for producing polymer foam, comprising an exiting channel having an exit with a cross-sectional area larger than a point within the exiting channel having a smallest cross-sectional area, wherein the exiting channel comprises a first portion from an entrance to the point and a second portion from the point to the exit; and

means for temperature regulating the second portion.

32. The system of claim 31, wherein the means for temperature regulating the second portion comprises at least one channel in the annular die for circulating a liquid.

33. The system of claim 31, wherein the cross-sectional area of the exit is at least about twice as large as that of the point.

34. The system of claim 31, wherein an exit angle for the annular die is between about 0° and about 90°.

35. The system of claim 31, further comprising a thermal break between the first portion and the second portion.

36. The system of claim 35, wherein the thermal break comprises at least one air gap.

37. The system of claim 31, wherein the first portion and the second portion are integrated.

38. The system of claim 31, wherein the second portion is coupled to the first portion.

39. The system of claim 31, further comprising a friction-reducing coating on at least a portion of an inner surface of the exiting channel.

40. The system of claim 39, wherein the friction-reducing coating comprises titanium nitride.

41. The system of claim 39, wherein the friction-reducing coating comprises tungsten carbon carbide.

42. The system of claim 39, wherein the friction-reducing coating comprises a composite comprising nickel and one of tetrafluoroethylene fluorocarbon polymer and fluorinated ethylene-propylene.

43. The system of claim 31, wherein a transition angle for the annular die is between about 15° and about 180°.